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**1996 AVIAN SURVEY RESULTS FOLLOWING THE
ARCO/FOUR CORNERS OIL SPILL (JANUARY 17, 1994) ON THE
SANTA CLARA RIVER, CALIFORNIA**

DRAFT
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Summary

This report presents preliminary results of the third year of avian surveys conducted in 1996, required by USFWS after the January 17, 1994 ARCO/Four Corners oil spill on the Santa Clara River, in Los Angeles County, California. In addition to the areas immediately affected by inundation of oil, two unaffected reference sites were chosen downstream to allow for comparison of bird population parameters between the affected and unaffected areas to assess any injuries to birds from the oil spill. Methods used to conduct the assessment included point counts, tape playback surveys, general surveys, and endangered species monitoring - which included least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo.

Point count data in 1996 indicated that both relative abundance and species richness were not significantly different between the affected area and reference sites. However, the mean relative abundance of several water-related species (Killdeer and combined fisheating species: great egret, snowy egret, great-blue heron, black-crowned night-heron, green heron, Virginia rail and belted kingfisher) were significantly lower in the affected area. In contrast, a relatively common waterbird, the spotted sandpiper, showed no significant differences in relative abundance between the affected area and reference sites. Statistical analysis comparing data from previous years is not presented in this report.

No yellow-billed cuckoos or southwestern willow flycatchers were found during our surveys. Least Bell's vireos were present both in the affected area and reference sites - with 5 and 34 pairs, respectively, a substantial increase from 1995. In 1996, productivity in the affected area was lower than in 1995, and lower in the reference sites compared to the past two years. Overall productivity was consistent with that of wild populations elsewhere in the state. Four previously banded birds were captured to determine their identity. This report also contains a new section detailing the presence of other sensitive species found during the study.

Introduction

On 17 January 1994, an earthquake caused the rupture of an ARCO/Four Corners oil pipeline in Santa Clarita, California. The oil spilled into the Santa Clara River at McBean Parkway and spread approximately 15 miles to the Piru Creek confluence. In response to the spill, the California Department of Fish and Game (CDFG) and the US Fish and Wildlife Service (USFWS) on behalf of state and federal trust resources began conducting a cooperative preassessment to determine potential natural resource injuries. In an effort to assess impacts to these resources, namely wildlife and associated habitat, the CDFG and USFWS initiated studies within the spill area on macroinvertebrates, teleost fishes, herpetofauna, and avifauna. This document reports the results from the third year of field studies conducted in the spring of 1996.

The Impact Area

The Santa Clara River is one of the largest undammed rivers in Southern California, stretching east-west for 100 miles (Figure 1). The affected area is midway within the watershed and supports a variety of sensitive riparian habitats ranging in succession from mature willow and cottonwood forest to more disturbed areas of *Arundo*, *tamarix* and mulefat scrub. Several large marsh habitats are present which contain emergent bullrush, cattail, and young willow and cottonwood trees. In addition, much of this stretch of the river is contiguous with native upland habitats such as coastal sage scrub and oak woodland.

The abundance and distribution of birds is directly related to the quality and quantity of available habitat. As western riparian ecosystems are among the most productive habitats for birds in North America and among the rarest (Krueper 1992), it is not surprising that this part of the river supports a rich diversity of birds, including a number of endangered, threatened, and sensitive species. Much of this section of the river is included within US Fish and Wildlife Service Critical Habitat designation for the state and federally endangered least Bell's vireo.

Methods

In 1994, two reference sites were chosen as control areas for comparison to the spill area (treatment). Both sites are located downstream of the spill area near Santa Paula approximately 20 and 25 miles, respectively (Figure 1). Each site is 4.5 km long and combined (9 km) they are exactly half the size of the affected area. The sites were chosen according to several criteria: 1) vegetation composition was similar to that found within major portions of the affected area; 2) both sites supported least Bell's vireos, allowing for species specific comparisons; 3) they were in close proximity geographically; and, 4) they

were topographically similar to the affected area (i.e. east-to-west river flow within the same river valley). No sites were chosen up river from the spill due to the lack of comparable habitat. Although the reference sites were located downstream of the spill, the sites should have been uncontaminated since the oil was contained by several earthen dams 20 miles upstream, and most of the oil was cleaned from the river before heavy rains could wash it past the affected area (Abajian, pers. com.). The location of all counting points is presented in Figures 2, 3, 4, and 5.

The study design in 1996 was identical to the previous two years (Labinger et al. 1994). In general the study was composed of two parts: 1) impacts to the avian community, and 2) impacts to endangered species, including monitoring of known least Bell's vireo sub-populations (Labinger et al. 1994). Project design emphasized comparisons between points within the affected area, and between the affected area and non-affected areas. This approach allowed us to test the hypothesis that bird population parameters vary with respect to degree of habitat damage. Testing the validity of such a hypothesis forms the basis of many damage assessments (USDI 1994).

Methods employed in the study included point counts, tape playback surveys for three endangered species, general surveys, and least Bell's vireo monitoring. Least Bell's vireo monitoring began earlier in the season (24 April) than in previous years to better document breeding activity.

Quality Control

The same three biologists from the 1994 and 1995 studies were employed in 1996. Labinger and Greaves have over 10 years and Haupt has seven years of professional experience in field ornithology, including experience with the methods employed here. However, only Greaves and Labinger collected point count data due to scheduling problems.

Specific training procedures for each method are outlined in Labinger et al. (1994). Field data collected from each method was inspected daily by one of the biologists for accuracy and completeness.

Statistical Analysis

All pertinent data were entered into IBM-compatible computers by one or more of the field personnel. After all data were entered, hard copies were printed and compared with original data sheets by reading data aloud to a second biologist.

Statistical analysis concentrated mostly on point count data. We calculated mean relative abundance for each species from combined data of the two observers. Relative abundance

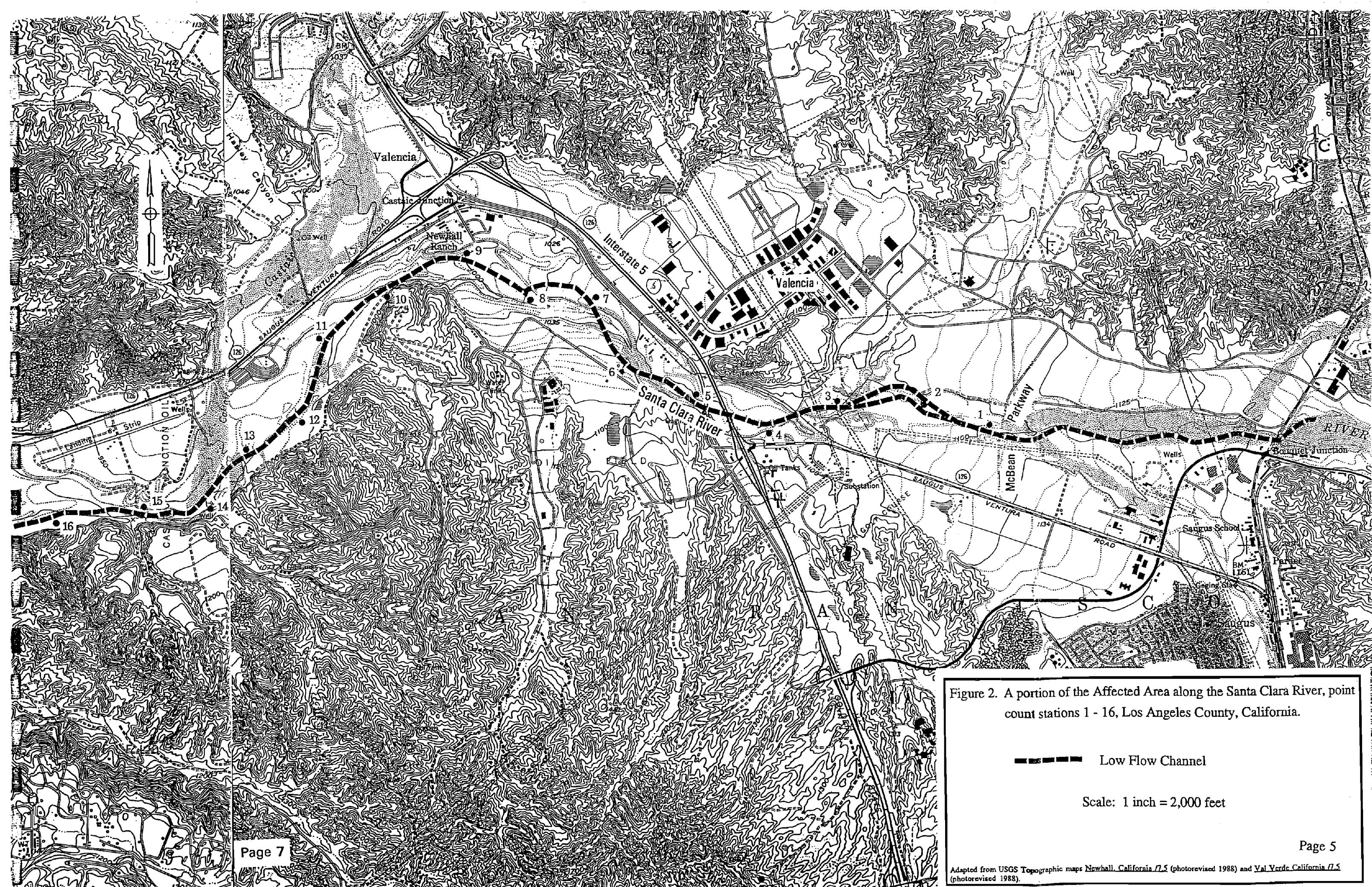


Figure 2. A portion of the Affected Area along the Santa Clara River, point count stations 1 - 16, Los Angeles County, California.

Low Flow Channel

Scale: 1 inch = 2,000 feet

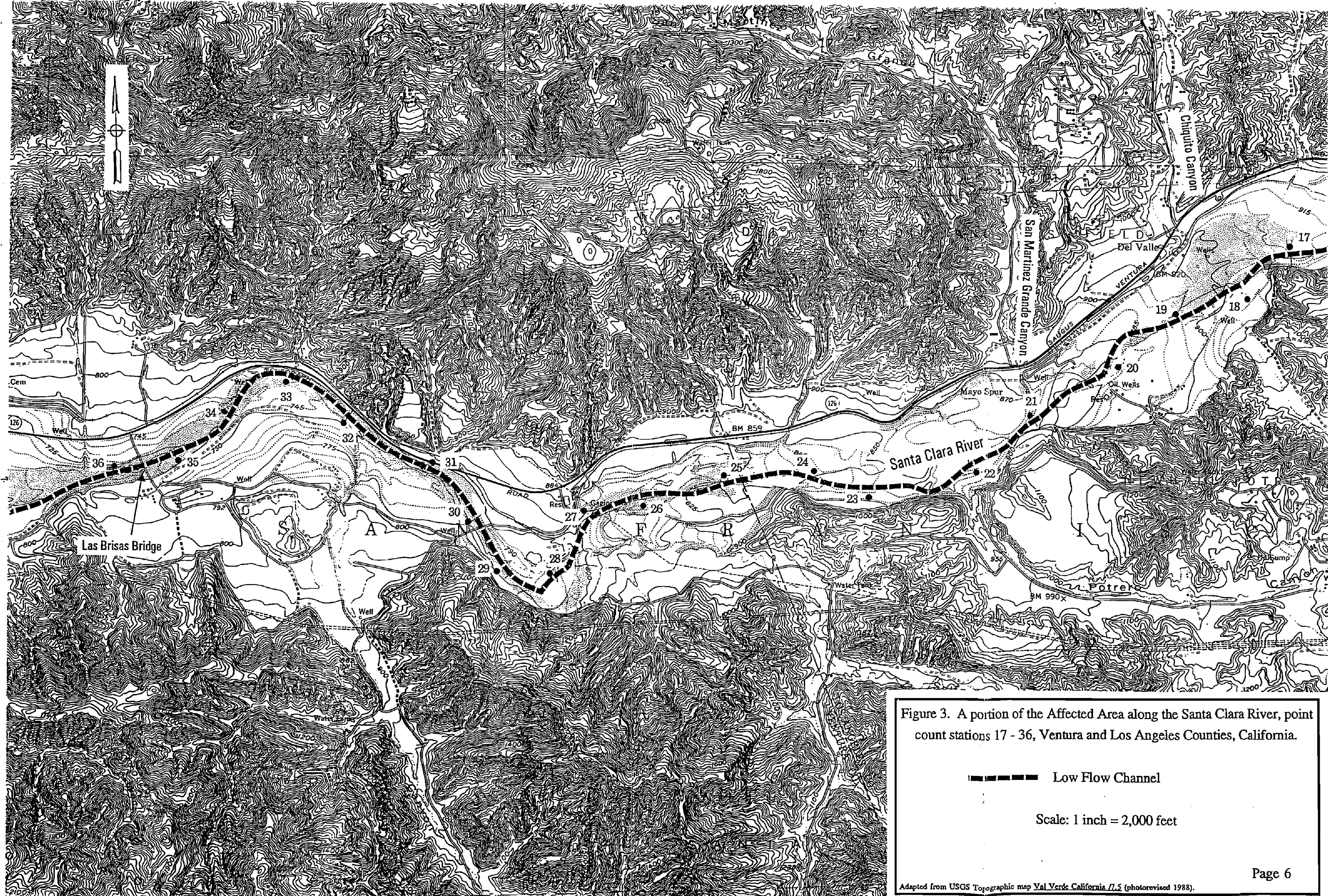


Figure 3. A portion of the Affected Area along the Santa Clara River, point count stations 17 - 36, Ventura and Los Angeles Counties, California.

Low Flow Channel

Scale: 1 inch = 2,000 feet

Adapted from USGS Topographic map Yal Verde California 17.5 (photorevised 1988).

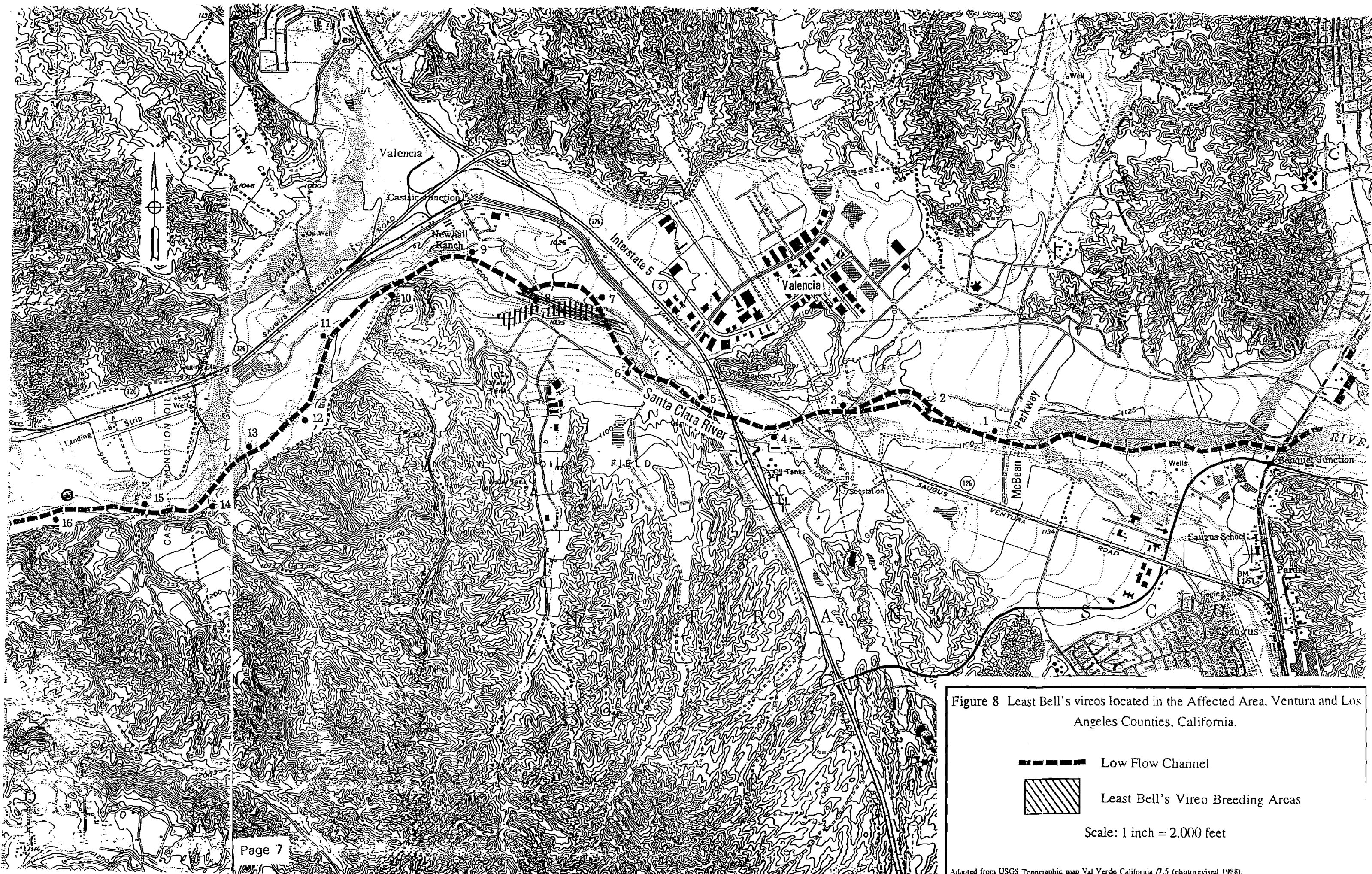


Figure 8 Least Bell's vireos located in the Affected Area, Ventura and Los Angeles Counties, California.

Low Flow Channel
Least Bell's Vireo Breeding Arcs

Scale: 1 inch = 2,000 feet

Adapted from USGS Topographic map Val Verde California 7.5 (photorevised 1988).

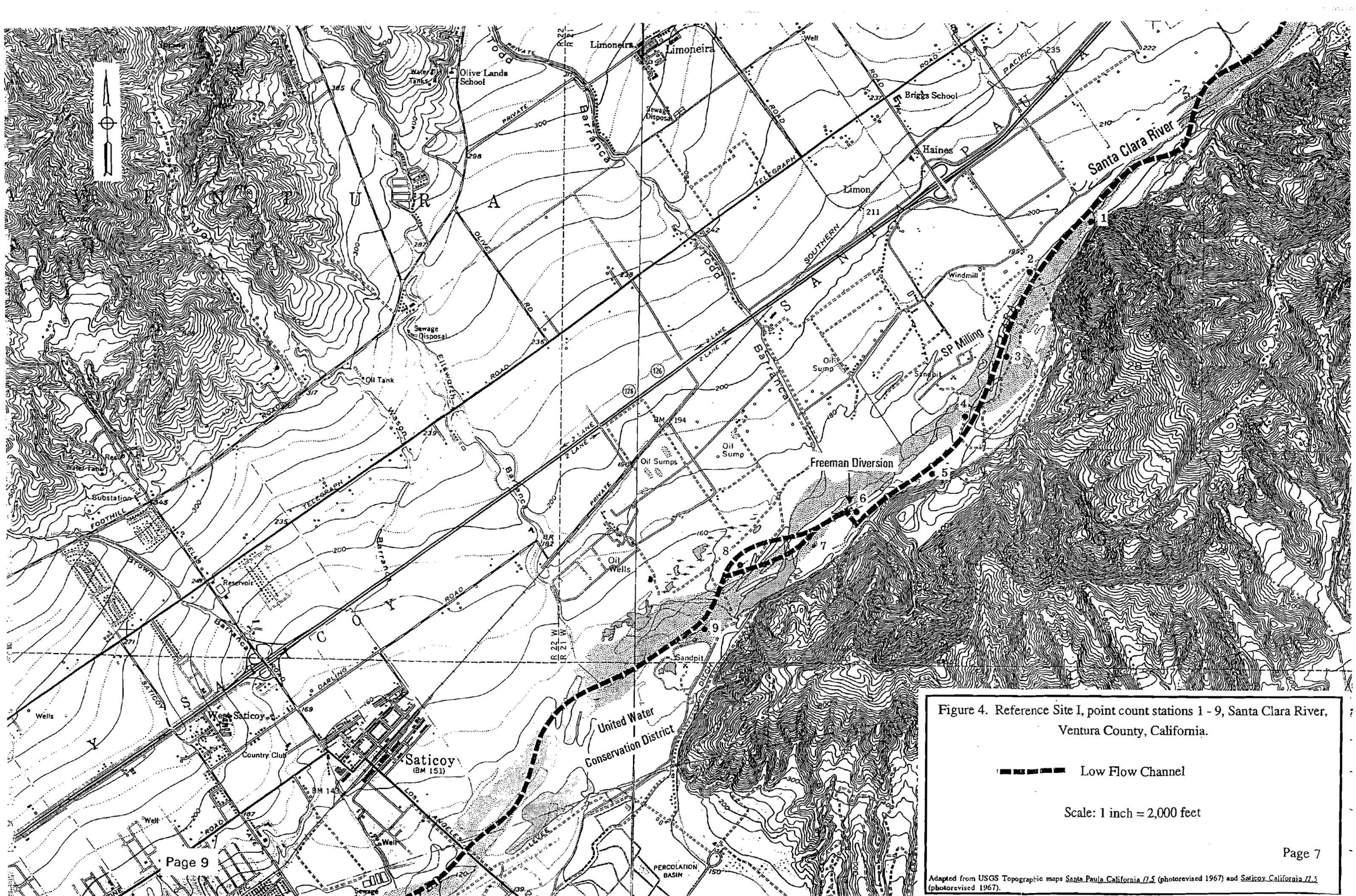


Figure 4. Reference Site I, point count stations 1 - 9, Santa Clara River, Ventura County, California.

Low Flow Channel

Scale: 1 inch = 2,000 feet

Adapted from USGS Topographic maps Santa Paula California 7.5 (photorevised 1967) and Saticoy California 7.5 (photorevised 1967).

and species richness (number of species) was determined for each point. In contrast to past data, the relative abundance was found to deviate significantly from a normal distribution; whereas, species richness followed a normal distribution. Thus, we used the nonparametric Mann-Whitney U method to test the relationships between points within the affected area, and between the affected area and reference sites. In this report we have not analyzed the results in relation to data from previous years.] ?

The scope of this study did not include exhaustive literature search of historical data for the study area. Much of this information is in private documents since all the affected area is private property. Much of the information that is available can not be used for statistical comparisons due to differences in methodology.

Results

Point Counts

The mean relative abundance for each species is presented by study area section and reference sites in Appendix A. Species richness and total mean relative abundance is presented in Table I. Relative abundance of all species combined was not significantly different between the reference sites and the affected area ($P=0.212$). Species richness was also not significantly different between the reference sites and affected area ($P=0.804$). No trends were found between points within the affected area in relative abundance or species richness. In other words, these parameters did not increase or decrease in relation to distance from the initial spill area.

Relative abundance of the three most abundant species is presented in Table II. As with most census methods, point counts tend to be more accurate for abundant species (Verner 1985). Therefore, three of the most abundant species were analyzed separately (common yellowthroat, song sparrow, and house finch). Of the three species, only the song sparrow showed a significant difference in mean relative abundance between the affected area and the reference sites; being greater in the affected area ($P<0.05$).

The relative abundance of water-related species were also examined separately (Table 1). All of these species spend a majority of their time foraging and/or nesting on the ground near water, and therefore, were more likely to be directly affected by the oil spill. Of the two most common water-related species, spotted sandpiper and killdeer, only the killdeer was significantly more abundant in the reference sites ($P<0.005$). The relative abundance of the less common waterbirds (all fish-eaters: great egret, great-blue heron, snowy egret, green heron, black-crowned night-heron, Virginia rail, and belted kingfisher) were pooled for analysis to increase the sample size. Relative abundance of these species combined was significantly lower in the affected area than in the reference sites ($P<0.01$).

TABLE I. Comparison of mean species richness and relative mean abundance of points per section within study area (Standard Deviation in parenthesis).

	AFFECTED AREA (SECTION)					REFERENCE SITE				P ¹
	1	2	3	4	Total	I	II	Total		
Relative Abundance	27.33(6.64)	47.56(30.41)	27.50(6.29)	34.78(17.95)	34.29(19.33)	50.50(28.10)	26.33(6.33)	38.42(23.35)	0.212	ns
Richness	21.67(4.55)	26.11(4.91)	25.00(4.95)	21.78(4.44)	23.64(4.93)	27.56(3.21)	20.56(3.24)	24.06(4.77)	0.804	ns
Total Richness	54	55	53	52	74	59	49	66		

1. Mann-Whitney Test of Affected area versus Reference site: ns -- not significant, * -- significant.

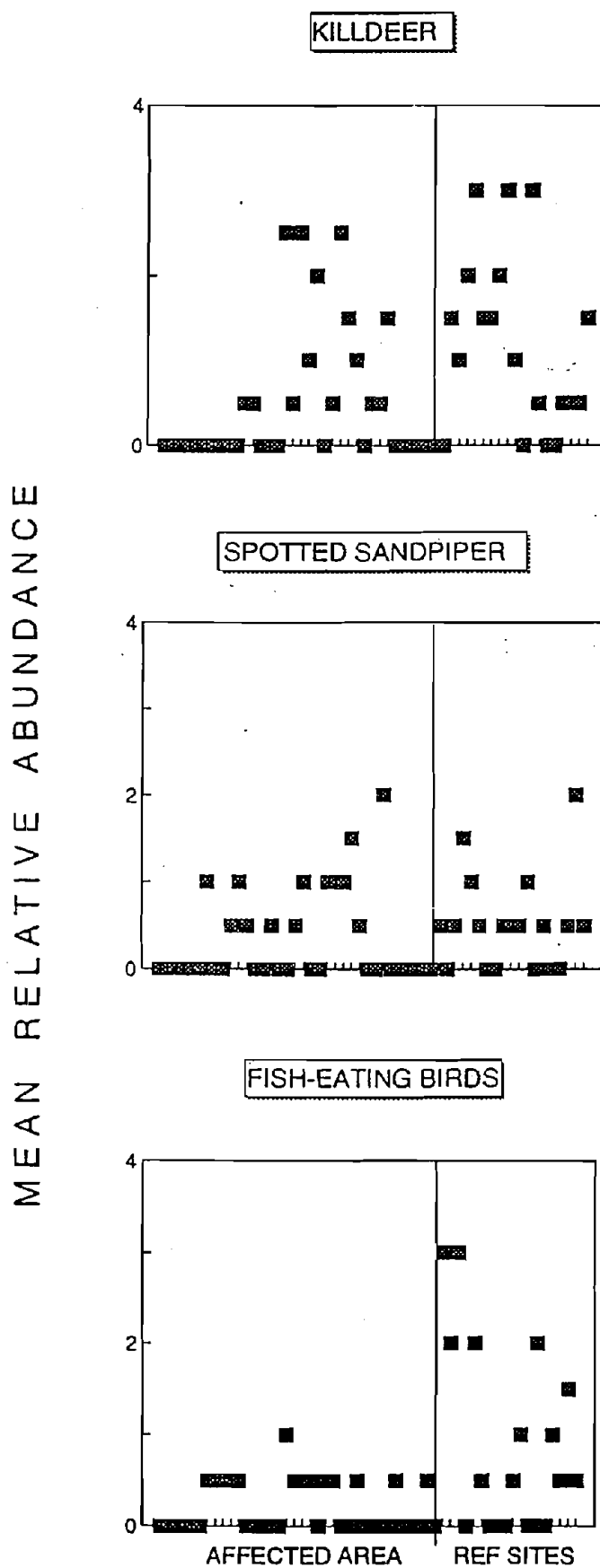
TABLE II. Mean relative abundance of the three most common species and water-related species in the study area (Standard Deviation in Parenthesis).

	AFFECTED AREA (SECTION)					REFERENCE SITE				
	1	2	3	4	Total	I	II	Total	P ¹	
Abundant Species										
Common Yellowthroat	1.89(1.08)	1.33(1.03)	1.67(0.43)	1.94(0.58)	1.46(0.95)	1.61(0.86)	1.67(1.00)	1.64(0.90)	0.491	ns
Song Sparrow	2.00(0.79)	2.06(0.95)	1.00(0.56)	2.28(0.94)	1.83(0.93)	0.78(0.87)	1.83(1.41)	1.31(1.26)	0.043	*
House Finch	2.22(1.62)	2.78(3.26)	1.33(1.62)	1.83(1.06)	2.04(2.04)	1.44(1.04)	0.94(0.95)	1.19(1.00)	0.183	ns
Water-related Species										
Killdeer	0.00(0.00)	0.72(1.03)	1.00(0.87)	0.22(0.57)	0.49(0.80)	1.83(0.75)	0.72(0.97)	1.28(1.02)	0.003	*
Spotted Sandpiper	0.11(0.33)	0.33(0.35)	0.67(0.56)	0.28(0.67)	0.35(0.52)	0.50(0.50)	0.56(0.63)	0.53(0.55)	0.177	ns
Fisheaters ²	0.17(0.25)	0.28(0.36)	0.28(0.26)	0.11(0.22)	0.21(0.28)	1.17(1.32)	0.78(0.67)	0.97(1.04)	0.009	*

1. Mann-Whitney Test of Affected Area versus Reference site: ns -- not significant, * -- significant.

2. Fisheaters = Great Egret, Snowy Egret, Great-blue Heron, Black-crowned Night-heron, Green Heron, Virginia Rail and Belted Kingfisher.

Figure 6. Relative abundance of waterbirds along the study area. Fish-eating species include: Virginia Rail, Great Blue Heron, Great Egret, Snowy Egret, Green Heron, Black-crowned Night Heron, and Belted Kingfisher.



The relationship between mean relative abundance of these three water-related species and points along the affected area and reference sites is graphed in Figure 6. No trend with distance from the oil spill origin (i.e. upstream, point 1) is apparent from these plots. This is in contrast to past years where data did show significant positive trends.

General Surveys

Species detected during general surveys that were not detected during point counts are also listed in Appendix A. A total of 108 species were detected throughout the study area. Of these, 29 species (representing approximately 25% of the total) were detected only during the general surveys.

Productivity data were not collected in a consistent manner and with comparable effort, and therefore are difficult to analyze statistically. Highly detectable species such as the waterbirds may yield more reliable data. Juveniles were observed for each of the waterbird species expected to breed within the project area (green heron, black-crowned night heron, killdeer, spotted sandpiper); however, no spotted sandpiper juveniles were found within the spill area. Fewer nests of the ground nesting species (killdeer and spotted sandpiper) were found compared to previous years. This may be the result of a less intensive survey effort (only two observers), or a delayed breeding cycle due to late rains. The data do not indicate any significant differences in the number of juveniles between the affected area and reference sites.

Sensitive Species Surveys

No yellow-billed cuckoos or southwestern willow flycatchers were located during 1996 surveys.

Least Bell's vireos were found at three locations within the affected area (Las Brisas, Salt Creek, and Magic Mountain; Figures 7 and 8), and at the two reference sites (Figures 9 and 10). General population and productivity parameters for all vireo sites are presented in Tables III and IV. From 1995 to 1996, the population of least Bell's vireos within the study area increased approximately 20 percent, consistent with recent results found elsewhere in the state (USFWS, unpublished data). Productivity per successful pair at the reference sites was relatively high; where as, productivity decreased in the affected area.

Affected Area. In 1996, we found evidence of only two pairs of least Bell's vireos at the Salt Creek location, similar to 1995, but less than the 4 pairs located there in 1994. One pair of successful vireos was found at Las Brisas where a pair had been present in 1994. In addition, a second pair was found along the narrow stretch of river adjacent to highway 126 approximately 1 km upstream of the Las Brisas pair. At least two male and one female vireos were observed just north of Magic Mountain in a newly emerging riparian thicket.

TABLE III. Least Bell's Vireo territories, adults, juveniles and nests in affected and reference areas on Santa Clara River, Los Angeles and Ventura Counties, California, during 1996.

Attribute ¹	Affected Area			Reference Site		Total
	Magic Mtn.	Salt Creek	Las Brisas	I	II	
Territories	2	2	2	25	9	40
Males	2	2	2	25	8	39
Females	1	1	2	26	8	38
Known Pairs	1	2	2	26	8	39
Successful Pairs	1	0	2	22	3	28
Vireo Young	4	0	6	77	9	93+
Nesting attempts	1	3	2	33	10	49+
Nests successful	1	0	2	25	3	31+
Unknown outcome	0	0	0	0	1	1
Nests parasitized	0	0	0	0	0	0
Cowbird fledglings	0	0	0	0	0	0
Productivity						
A. (young/all pairs)	4.0	0	3.0	3.1	2.0	2.4 ²
B. (" /successful pairs)	4.0	0	3.0	3.4	4.0	3.3

¹ Includes fledglings observed in area where nests were not found and thus nesting presumed.

² Mean productivity for all areas combined.

TABLE V. Plant species used by least Bell's vireos for nest support in affected and reference areas on Santa Clara River, Ventura and Los Angeles Counties, California, during 1996.

Scientific Name ¹	Common Name	Nests in Affected Area		Nests in Reference Sites	
		Successful	Failed	Successful	Failed ²
<i>Artemisia douglasiana</i>	Mugwort	1	1	0	0
<i>Atriplex lentiformis</i>	Salt Brush	0	1	0	0
<i>Baccharis salicifolia</i>	Mulefat	0	0	8	5
<i>Rhus integrifolia</i>	Lemonadeberry	0	0	0	1
<i>Salix exigua</i>	Narrowleaf Willow	0	0	4	1
<i>Salix laevigata</i>	Red Willow	0	0	10	3
<i>Salix lasiandra</i>	Yellow Willow	1	0	1	1
<i>Salix lasiolepis</i>	Arroyo Willow	0	1	0	1
<i>Toxicodendron</i> sp.	Poison Oak	0	0	0	1
Totals		3	3	28	13

1. Nomenclature follows Munz (1974) and Smith (1976).
2. Included among the known failed nests are two found after their use, which appeared to have failed given the absence of feather sheathing in the nests. Because they were in actively defended territories, they were considered failures due to predation.

Three of the 10 adults found in the affected area were banded as nestlings in 1995 as part of this study.

Six nests were found in the affected area: one at the Magic Mountain area; three in Salt Creek area; and two downstream between Salt Creek and Las Brisas. Three of the nests were successful. Two nests may have failed due to cows, where paths were located through nest sites. Another nest was found after it had been abandoned, possibly before nestling stage, as no evidence of feather sheathing powder was found in the nest cup. No vireo nests were parasitized in the affected area during the 1996 study (although a pair of song sparrows was observed feeding a fledged cowbird).

Reference Sites. A total of 33 males were found at the two reference sites: 25 at Reference Site I and at least 8 at Reference Site II. Of 34 females at the reference sites, 26 were at Reference Site I and 8 at Reference Site II. Productivity at Reference Site II was higher than at either Reference Site I or the affected area, due to greater nest failure in those two areas. No vireo nests were parasitized in the reference sites during the 1996 study, although one pair of wrentits were parasitized twice in Reference Site I. As in previous years, relative abundance data from the point counts indicate that considerably fewer cowbirds were present in the reference sites than in the affected area (Figure 11).

Banding Results Seven nestlings from the affected area and 59 nestlings from the reference sites were banded with a US Fish and Wildlife numbered aluminum band and a drainage colored band. One male vireo, banded as a nestling on the San Luis Rey River, San Diego County, in 1993 (Kus, pers. comm.) was again present at Reference Site I in the same territory used in 1995. This territory is in the vicinity of another territory held by two vireos (from 1991-94) that were banded as nestlings in San Diego County (Greaves, unpubl. data). Four adults (2 males in the affected area downstream of the Los Angeles-Ventura County line, a male in Reference Site II, and a female in Reference Site I) were caught to obtain their band numbers in order to determine their origins, and one unbanded male was caught and banded. The captured female had been banded in 1993 at Gibraltar Reservoir on the Santa Ynez River, Santa Barbara County in a nest from which a cowbird egg had been removed. This is the first documented dispersal from Gibraltar, the northern most and isolated vireo population. The two males caught in the affected area were banded as nestlings in 1995 at the Salt Creek area; in 1996, each male attempted to nest within a mile and 300 meters, respectively, of where they had been raised. Such dispersal data provides important information for managing this species and its habitat.

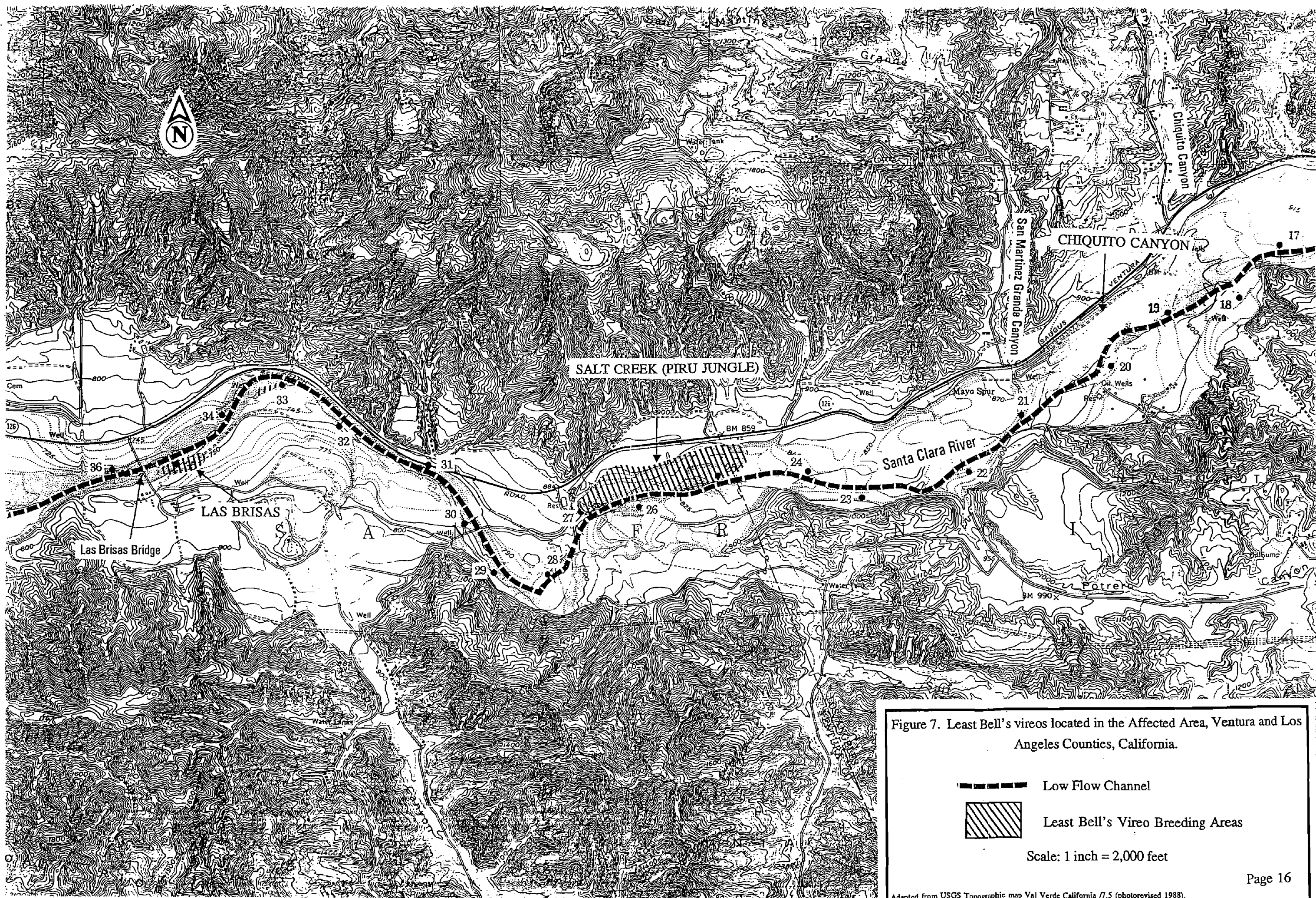


Figure 7. Least Bell's vireos located in the Affected Area, Ventura and Los Angeles Counties, California.

- Low Flow Channel
- ▨ Least Bell's Vireo Breeding Areas

Scale: 1 inch = 2,000 feet

Adapted from USGS Topographic map Val Verde California 7.5 (photorevised 1988).

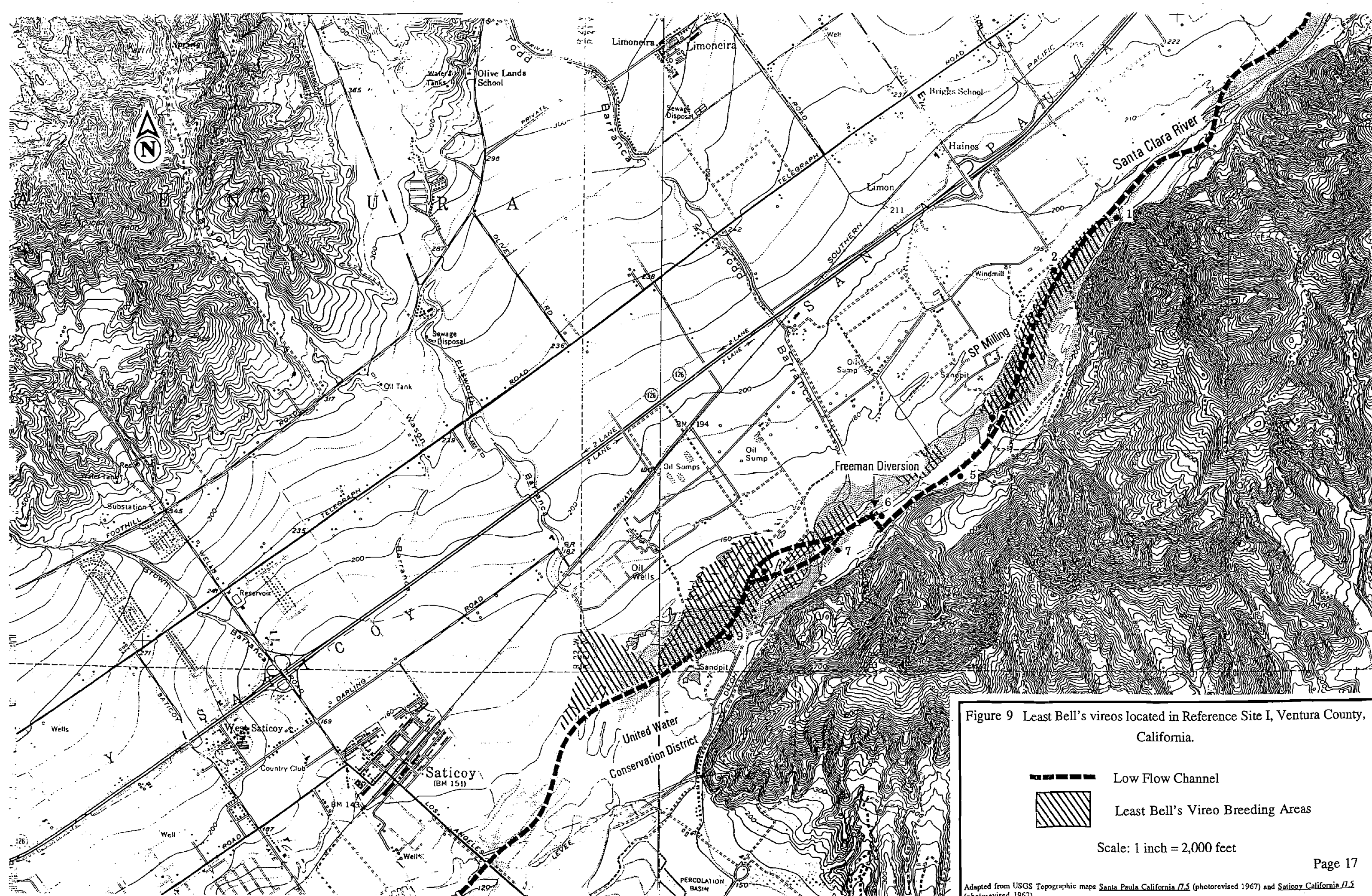




Figure 9 Least Bell's vireos located in Reference Site I, Ventura County, California.

-  Low Flow Channel
-  Least Bell's Vireo Breeding Areas

Scale: 1 inch = 2,000 feet

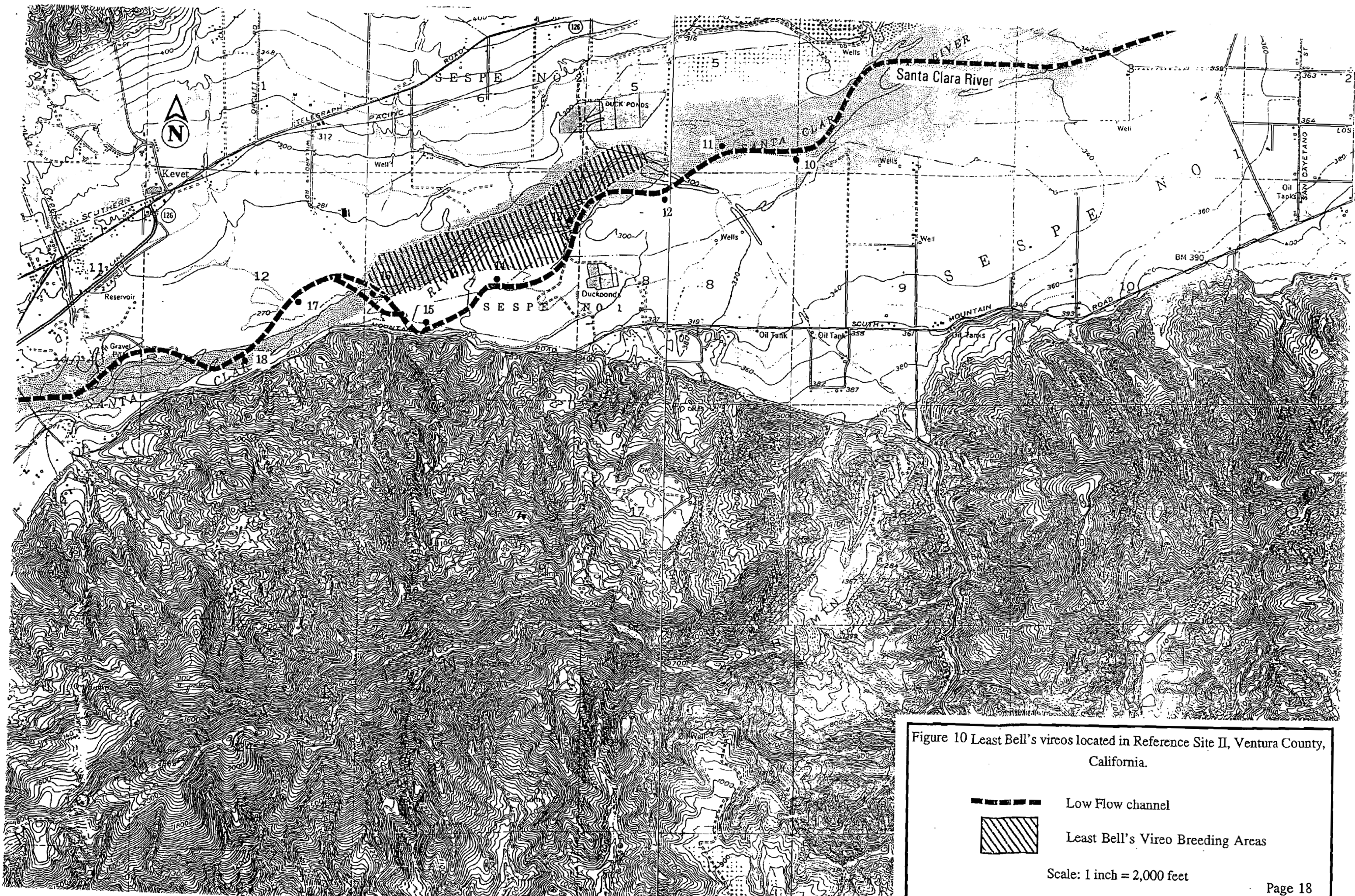


Figure 10 Least Bell's vireos located in Reference Site II, Ventura County, California.



Low Flow channel



Least Bell's Vireo Breeding Areas

Scale: 1 inch = 2,000 feet

SENSITIVE SPECIES ACCOUNTS

Endangered and Threatened Species

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)

The yellow-billed cuckoo is an insectivorous neotropical migrant. It occurs throughout North America and is divided into eastern (*C. a. americanus*) and western subspecies.

Western yellow-billed cuckoos arrive late in the season at the end of June through the beginning of July and stay until late August and September (Laymon & Halterman 1987). In general, this species requires broad woodlands of even-aged growth, preferring older growth cottonwood or other canopied riparian woods for breeding sites (Gaines and Laymon 1984). Highly specific foods occurring in cyclic infestations (such as hairy caterpillars and tree frogs) are also important determinants in cuckoo distribution and productivity (Laymon & Halterman 1987).

The western yellow-billed cuckoo is listed state endangered and has no federal endangered status. Historically cuckoos were widespread in the state, but have declined to only three small populations (Gaines & Laymon 1984). Although detailed historical data are lacking from the South Coast region, cuckoo breeding has been documented along the Santa Clara River (Willet 1933). More recently, a cuckoo was observed between 23 June and 4 July 1979, on the Santa Clara River within the area affected by the oil spill (Webster in Garret & Dunn 1981). A dead cuckoo was found in the parking lot at Magic Mountain (adjacent to the affected area) on 3-5 July 1981 (specimen at CSU Northridge, California; Laymon pers. comm.). Finally, in July 1992, a cuckoo was heard within the affected area (Holmgren M. pers. comm.). No cuckoos have been observed during this study.

Least Bell's vireo (*Vireo bellii pusillus*)

The Bell's vireo is a small insectivorous neotropical migrant which nests in the low vegetation associated with thickets of willow and mulefat in riparian woodlands. The least Bell's vireo is one of the four subspecies recognized in North America (Brown 1993). Formerly widespread in California, the species underwent a dramatic decline in abundance and range during the first half of the 20th century (Grinnell and Miller 1944; Gaines 1977). It was designated an endangered species by the California Fish and Game Commission in 1980 (CDFG 1986) and was listed as endangered by the Federal government in 1986 (USFWS 1986).

The species arrives in late March through April and departs from late August through September. Nesting usually begins several days after pair formation. Nests are typically placed in the fork of a shrub, small tree or in weeds, suspended within a meter of the ground

in dense scrub vegetation found in or adjacent to the river bottom (Gray and Greaves 1984).

Although the historic breeding range of least Bell's vireos extended throughout much of California (Wilbur 1979 and 1980), the present breeding range is limited to about 50 locations from Santa Barbara County south to San Diego County, where the majority of the population is found (Franzreb 1989). They have been observed within the spill area over the past decade (Independent Environmental Consultants 1993; Labinger et al. 1994) and breeding was documented by Holmgren (1992). Several other small subpopulations exist on the lower stretch of the Santa Clara River outside the spill area (Labinger et al. 1994). Annual surveys were conducted from 1991 through 1994 as part of a cowbird trapping program for the lower river in Ventura County (Sweetwater Environmental Biologists 1991). Data on least Bell's vireo nesting and productivity on the Santa Clara River has been compiled annually since 1991 (Greaves, Labinger, Haupt and Holmgren unpubl. data).

Least Bell's vireo populations appear to be slowly increasing from approximately 300 pairs (1974-1985, Franzreb 1989) to over 1,000 pairs in 1994 (USFWS, unpubl. data). This increase apparently is due in part to removal of cowbirds from habitats near major breeding populations and improved protection of riparian woodlands along the major rivers of southern California (USFWS, unpubl. data). Least Bell's vireo populations monitored during this study are discussed above in section Sensitive Species Surveys.

Southwestern willow flycatcher (*Empidonax traillii extimus*)

The willow flycatcher is a small, insectivorous neotropical migratory species ranging broadly from the east coast through most of the lower 48 states and parts of Canada. Willow flycatchers breed in a variety of wet habitats, particularly swamps and riparian thickets, especially willow (Garrett & Dunn 1981). Formerly widespread in the southwest and sporadically distributed in California, the species has declined in recent decades.

There are three recognized subspecies of willow flycatcher in California (all are State Endangered), of which the southwestern race (recently listed as Federally Endangered) is the most likely to occur in coastal southern California (Schlorff 1990). A few small populations persist in coastal southern California, including one on the Santa Ynez River, Santa Barbara County (Unitt et al. in prep), and one on the Santa Margarita River in San Diego County (Buck, pers. comm.). On the Santa Clara River, no breeding birds have been documented in recent years within the area affected by the spill. However, Webster (in Garrett & Dunn 1981) encountered several singing males, assumed to be breeding, between June and July 1979, assumed to be breeding, within the study area, and several, apparently non-breeding individuals have been found during recent surveys (Labinger et al. 1994; and reported here ^{where} for 1995).

The decline of the southwestern willow flycatcher is believed to be the result of habitat loss

from agriculture, especially livestock grazing, water diversion projects and continued urbanization of riparian corridors. In addition, brood parasitism by cowbirds appears to have suppressed productivity, and probably hinders the re-colonization of former breeding areas (Whitfield 1990).

Other Sensitive Species

Great Blue Heron (*Ardea herodias*)

Great blue herons are listed on the California Natural Diversity Data Base as a species that warrants monitoring. Along the central and south coast, breeding sites of this species are increasingly uncommon (Garrett and Dunn 1981, Lehman 1994). Great blue herons require marsh, riparian and grassland for foraging and mature, tall trees for nesting.

Great blue herons were found in low numbers throughout the study area, except for Section 4 of the affected area. This species is most common on the lower Santa Clara River within the reference sites. No nesting was observed; however, three juvenile herons were observed (one in each of the reference sites and one in the affected area).

Great Egret (*Casmerodius albus*)

Great egrets are listed on the California Natural Diversity Data Base as a species that warrants monitoring. Breeding sites are increasingly uncommon throughout much of southern California (Garrett and Dunn 1981). Great egrets require marsh, riparian, grassland or agricultural fields for foraging and mature, tall trees for nesting.

Only 2-3 individuals were found within the study area, and limited to Reference Site I and Section 3 of the affected area. No nesting was observed.

White-tailed Kite (*Elanus leucurus*)

White-tailed kites are a California Species of Special Concern. Although breeding populations fluctuate greatly, declines continue to be recorded throughout California (Lehman 1994). Kites forage over open habitats such as marsh, grassland and savannah, and nest in trees in riparian and oak woodland. Their diet is composed primarily of small mammals.

At least four pairs of white-tailed kites were found within the study area in 1996. Each reference site had a pair (although none were recorded on point counts for Reference Site II). Within the affected area, one pair was observed within sections 2 and 3, and a second pair was observed in Section 4. At least 5 Juvenile kites were observed along Section 2 (affected area) and at least 2 juveniles were found at Reference Site I. The kite population within the study area appears to have increased since 1994, corresponding to a general increase

throughout the state (Labinger, unpublished data).

Cooper's Hawk (*Accipiter cooperi*)

The Cooper's hawk is a California Species of Special Concern. In southern California birds are mostly resident, however populations are augmented in winter with northern birds. Cooper's Hawks are uncommon breeders in Southern California but fairly evenly distributed where appropriate habitat exists (Garrett and Dunn 1981, Lehman 1994). Nests throughout most of California from March through July. During the breeding season they require woodlands (preferably live oak and riparian) adjacent to semi-open habitat where they feed primarily on small birds.

Cooper's hawks were observed at Reference Site I and at sections 1 and 4 of the affected area. A nest was found near point 3 (affected area); chicks could not be seen, but the adults were actively defending the area against human intruders. This area has supported a breeding pair of Cooper's hawks since the inception of this study in 1994. During the first two years of this study, Cooper's hawks were also documented breeding within sections 2 and 3.

Golden Eagle (*Aquila chrysaetos*)

The golden eagle is a California Species of Special Concern. In southern California they are an uncommon resident raptor that breeds from January through July (Garrett and Dunn 1981, Lehman 1994). They require large open areas such as grassland, scrub and oak savannah for foraging and large trees or cliffs for nesting.

A pair of adult golden eagles were observed on one occasion near point 1 in the affected area. This is the first observation of golden eagles during the study.

Horned Lark (*Eremophila alpestris*)

Horned Larks are a California Species of Special Concern. They are resident throughout California in areas of large open grassland and agricultural fields. Although large flocks can be seen during the winter, breeding appears to be more uncommon (Garrett and Dunn 1981).

At least 2-3 horned larks were observed near point 9 in the agricultural fields adjacent to the river bottom. In past years of this study, horned larks have been observed also along Section 2 of the affected area.

Loggerhead Shrike (*Lanius ludovicianus*)

The Loggerhead Shrike is a California Species of Special Concern. They are resident along

the central and south coast, where numbers increase in the winter. Further inland, shrikes are locally common in open areas of grassland and scrub and are uncommon breeders along the mountains and coastal plain (Garrett and Dunn 1981, Lehman 1994).

This species is conspicuously absent from the river bottom, in contrast to known populations along the adjacent mountain ranges (Labinger, unpublished data). One individual was observed at Reference Site I near point R-3.

Yellow Warbler (*Dendroica petechia*)

The yellow warbler is a California Species of Special Concern. This neotropical migrant is fairly common locally where mature riparian woodland exists. Numbers have been decreasing steadily throughout California, especially in southern California (Garrett and Dunn 1981). Nests in the upper canopy of riparian trees, commonly willow species.

Yellow warblers are found throughout the study area, but were significantly more common at Reference Site I where relative abundances were 4 to 6 times greater than other sections (Appendix A). Very low populations exist along the upper portions of the study area (Sections 1 and 2) where only 1-2 pairs were present. This is unexpected given the extent of seemingly suitable habitat along these portions of the affected area. Yellow warblers appear to be highly susceptible to cowbird parasitism which may partly explain their low numbers within the affected area.

Yellow-breasted Chat (*Icteria virens*)

The yellow-breasted chat is a California Species of Special Concern. This neotropical migrant is locally common to rare in riparian woodland of southern California. Numbers have been decreasing steadily throughout California, especially in southern California (Garrett and Dunn 1981). Nests in low, thick riparian vegetation.

Yellow-breasted chats are patchily distributed over available habitat within the study area. They are much more common at the reference sites where relative abundances were 5 to 10 times greater than in the affected area (Appendix A). Only 1-2 pairs were present along each of the first three sections within the affected area, despite the presence of seemingly suitable habitat along those areas.

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Mean relative abundance of bird species detected during 1996 surveys along the affected area and reference sites (mean in bold, standard error in normal font; species detected not during a point count are noted with " * ").

SPECIES			AFFECTED AREA (SECTIONS)					REFERENCE SITES		
	1	2	3	4	I	II				
Pied-billed Grebe					*					
Double-crested Cormorant					*					
American Bittern										
Great Blue Heron	0.06	0.17	0.22	0.11	0.22	0.00	0.00	0.00	0.22	0.25
Great Egret	0.06	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.16
Snowy Egret	0.00	0.00	0.00	0.00	0.00	0.56	0.83	0.00	0.00	0.00
Cattle Egret										
Green Heron	0.00	0.00	0.17	0.11	0.22	0.56	0.83	0.44	0.50	0.50
Black-crowned Night-Heron	0.06	0.17	0.00	0.00	0.00	0.06	0.16	0.00	0.00	0.00
Mallard	0.00	0.00	0.33	0.28	0.57	0.06	0.16	0.00	0.00	0.00
Cinnamon Teal						*				
Red-breasted Merganser						*				
Turkey Vulture	0.00	0.00	0.35	0.00	0.00	0.06	0.16	0.00	0.00	0.00
White-tailed Kite	0.00	0.00	0.83	0.22	0.26	0.06	0.16	0.00	0.00	0.00
Cooper's Hawk	*					*				
Red-shouldered Hawk	0.56	0.46	0.44	0.28	0.36	0.11	0.21	0.00	0.11	0.31
Red-tailed Hawk	0.11	0.22	0.26	0.06	0.17	0.28	0.48	0.06	0.06	0.16
Golden Eagle	*									
American Kestrel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.16
California Quail	0.22	0.44	0.44	0.11	0.22	0.00	0.00	0.72	0.58	0.48
Virginia Rail	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Killdeer	0.00	0.00	1.03	1.00	0.87	0.22	0.48	1.83	0.71	0.92
Tringa Yellowlegs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.48	0.00
Spotted Sandpiper	0.11	0.33	0.35	0.67	0.56	0.28	0.63	0.50	0.47	0.60
Least Sandpiper						*		*		
Bonaparte's Gull						*		*		
Heermann's Gull						*		*		
Western Gull						*		*		
Common Ground-dove										
Rock Dove	0.17	0.50	0.83	0.00	0.00	0.11	0.31	0.00	0.00	0.00
Spotted Dove										
Mourning Dove									*	
Greater Roadrunner	0.06	0.17	1.32	0.67	0.75	0.56	0.68	2.17	2.00	0.44
Common Barn-Owl	*							*	*	
Great Horned Owl										
Lesser Nighthawk								*		
White-throated Swift	0.00	0.00	1.01	0.06	0.17	0.28	0.48	0.11	0.21	0.17
Costa's Hummingbird	0.00	0.00	0.00	0.00	0.00	0.06	0.17	0.06	0.17	0.00
Anna's Hummingbird	0.22	0.44	0.17	0.06	0.17	0.00	0.00	0.28	0.42	0.00
Hummingbird sp	0.17	0.25	0.17	0.06	0.26	0.06	0.16	0.17	0.24	0.00

AFFECTED AREA (SECTIONS)

REFERENCE SITES

SPECIES	1	2	3	4	I	II
Belted Kingfisher	0.00	0.00	0.06	0.17	0.00	0.06
Nuttall's Woodpecker	0.67	0.56	0.61	0.55	0.11	0.17
Downy Woodpecker	0.17	0.25	0.22	0.36	0.06	0.17
Hairy Woodpecker	0.17	0.25	0.17	0.25	0.11	0.06
Northern Flicker	0.00	0.00	0.17	0.50	0.39	0.53
Woodpecker sp.	0.00	0.00	0.00	0.00	0.00	0.11
Western Wood-Pewee	0.06	0.17	0.00	0.00	0.17	0.47
Pacific-slope Flycatcher	0.28	0.51	0.83	0.79	0.67	1.00
Black Phoebe	0.00	0.00	0.00	0.00	0.11	0.00
Say's Phoebe	0.61	0.33	1.39	0.65	0.22	0.53
Ash-throated Flycatcher	0.06	0.17	0.00	0.00	0.33	0.06
Cassin's Kingbird	0.06	0.17	0.17	0.35	0.00	0.00
Western Kingbird	0.06	0.17	0.00	0.00	0.00	0.00
Kingbird sp.	0.11	0.33	0.00	0.00	0.00	0.00
Horned Lark	0.00	0.00	0.44	0.53	0.78	1.94
Tree Swallow	0.11	0.22	0.39	0.82	0.33	0.67
Violet-green Swallow	1.89	0.93	1.22	1.44	0.94	1.22
Northern Rough-winged Swallow	1.56	1.81	2.11	2.37	4.56	3.11
Cliff Swallow	0.44	0.92	0.00	0.00	0.22	0.34
Barn Swallow	0.00	0.00	0.00	0.00	0.00	0.00
Swallow sp.	0.89	0.74	0.50	0.86	0.06	0.00
Scrub Jay	1.72	1.44	0.94	1.74	0.06	0.00
American Crow	0.94	0.68	0.61	0.55	0.06	0.16
Common Raven	0.89	1.02	0.89	0.49	0.00	0.06
Plain Titmouse	0.33	0.71	0.56	0.73	1.00	0.64
Common Bushitit	0.00	0.00	0.00	0.00	0.00	0.00
White-breasted Nuthatch	1.50	0.87	1.22	0.51	0.78	0.31
Bewick's Wren	0.22	0.51	0.17	0.50	0.00	0.00
House Wren	0.06	0.17	0.06	0.17	0.00	0.00
Blue-gray Gnatcatcher	0.00	0.00	0.00	0.00	0.00	0.00
Western Bluebird	0.00	0.00	0.00	0.00	0.00	0.00
Swainson's Thrush	0.00	0.00	0.00	0.00	0.00	0.00
American Robin	0.06	0.17	0.44	0.68	0.22	0.39
Wrenitit	0.00	0.00	0.00	0.00	0.06	0.00
Northern Mockingbird	0.00	0.00	0.06	0.17	0.22	0.11
California Thrasher	0.28	0.67	0.22	0.26	0.11	0.00
Phainopepla	0.17	0.35	0.28	0.44	9.17	0.00
Loggerhead Shrike	0.06	0.17	0.11	0.22	1.39	0.17
European Starling	0.06	0.17	0.00	0.00	0.06	0.00
Bell's Vireo	0.06	0.17	0.00	0.00	0.06	0.00
Hutton's Vireo	0.00	0.00	0.00	0.00	0.06	0.00
Warbling Vireo	0.00	0.00	0.00	0.00	0.11	0.00
Solitary Vireo	0.00	0.00	0.00	0.00	0.00	0.00
Nashville Warbler	0.06	0.17	0.00	0.00	0.06	0.00
Townsend's Warbler	0.00	0.00	0.00	0.00	0.00	0.00

REFERENCE SITES

AFFECTED AREA (SECTIONS)

SPECIES

	1	2	3	4	5	6
Black-throated Gray Warbler						
Wilson's Warbler						
Orange-crowned Warbler						
Yellow Warbler						
Common Yellowthroat						
Yellow-breasted Chat						
Western Tanager						
Black-headed Grosbeak						
Blue Grosbeak						
Lazuli Bunting						
Indigo Bunting						
Spotted Towhee						
California Towhee						
Rufous-crowned Sparrow						
Lark Sparrow						
Song Sparrow						
Sparrow sp.						
Red-winged Blackbird						
Brewer's Blackbird						
Brown-headed Cowbird						
Blackbird sp.						
Hooded Oriole						
Bullock's Oriole						
Oriole sp.						
Purple Finch						
House Finch						
Finch sp.						
Lesser Goldfinch						
Lawrence's Goldfinch						
American Goldfinch						
Goldfinch sp.						
House Sparrow						
Total						

Dendroica nigrescens

Wilsonia pusilla

Vermivora cedata

Dendroica petechia

Geothlypis trichas

Icteria virens

Piranga ludoviciana

Peucaea melanocephala

Guiraca caerulea

Passerina amoena

Passerina cyanea

Pipilo erythrophthalmus

Pipilo crissalis

Amphispiza bilineata

Chondestes grammacus

Melospiza melodia

Agelaius phoeniceus

Euphagus cyanocephalus

Molothrus ater

Icterus cucullatus

Icterus bullocki

Carpodacus purpureus

Carpodacus mexicanus

Carduelis psaltria

Carduelis lawrencei

Carduelis tristis

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